## REMARKS

Claims 1-16 are pending in this application. By this amendment, Applicant amends claims 1, 3, 5, 7 and 15.

Claims 1-16 were rejected under 35 U.S.C. § 112, second paragraph, for allegedly being indefinite. Applicant has amended claims 1, 3, 5, 7 and 15 to correct the informalities contained therein. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

Claims 1, 2, 5-10, 12, 13, 15 and 16 were rejected under 35 U.S.C. § 102(a) as being anticipated by Kaida (U.S. 6,040,562), Kaida (U.S. 6,232,698), Ogawa (U.S. 4,894,580) or Kittaka (U.S. 4,939,403). And claims 3, 4, 11 and 14 were rejected under 35 U.S.C. § 102(a) as being anticipated by Kittaka. Applicant respectfully traverses these rejections.

Claim 1 has been amended to recite:

> "An energy-trap thickness extensional vibration mode piezoelectric resonator, comprising:
>
> a piezoelectric body including a plurality of piezoelectric layers and uniformly polarized in a thickness direction thereof; and
>
> N number of internal electrodes, where N equals 3, 4 or 5, arranged in the piezoelectric body on top of each other with the piezoelectric layers disposed therebetween; wherein
>
> **the piezoelectric body vibrates in an (N-1)th higher-order mode of a thickness extensional vibration mode generated by applying electric fields of opposite polarity alternately in the direction of thickness to piezoelectric layers between internal electrodes, and when the thickness of a piezoelectric layer between adjacent internal electrodes in the direction of thickness is denoted by D and the thicknesses of a first and second piezoelectric layer outside the outermost internal electrodes in the direction of thickness are denoted by $D_1$ and $D_2$, the following relationships are satisfied: $0.50 \leq (D_1 + D_2)/2D \leq 1.00$ at N = 3, $0.50 \leq (D_1 + D_2)/2D \leq 0.90$ at N = 4, and $0.50 \leq (D_1 + D_2)/2D \leq 0.80$ at N = 5.**" (Emphasis added)

Claims 3, 5 and 7 recite features that are similar to claim 1, including the emphasized features.

In conventional piezoelectric resonators utilizing harmonics of a thickness extensional vibration mode, the specific location and arrangement of the internal

electrodes has not been addressed. Due to this, the frequencies of the thickness extensional piezoelectric resonator fluctuate, especially the higher frequencies. For this reason, thickness extensional piezoelectric resonators have not been suitable for use at higher frequencies.

To overcome these problems, the present claimed invention provides an energy-trap thickness extensional piezoelectric resonator utilizing harmonics of a thickness extensional vibration mode having a greatly increased accuracy of frequencies when the device is operating at much higher frequencies. This greatly increased accuracy of frequencies is achieved by specifically locating and arranging the internal electrodes by specifically setting the thickness of the piezoelectric layers between the internal electrodes and the thickness of the piezoelectric layers outside the outermost electrodes as recited in the claims of the present application.

The Examiner alleges that Kaida '652, Kaida '698, Ogawa and Kittaka all teach piezoelectric resonators having three internal electrodes arranged such that D1 + D2/2D = 1, where D1 and D2 denote the thicknesses of a first and second piezoelectric layer outside the outermost internal electrodes in the direction of thickness, and D denotes the thickness of a piezoelectric layer between adjacent internal electrodes in the direction of thickness. Applicants respectfully disagree.

None of the cited references specifically teach **any** relationship between the thicknesses of the piezoelectric layers outside the outermost internal electrodes, and the thickness of any piezoelectric layer between adjacent internal electrodes, and certainly do not teach the specific relationships recited in claims 1, 3, 5 and 7. At best, Kaida ('652), Kaida '698, Ogawa and Kittaka merely illustrate piezoelectric layers which appear to be approximately the same thickness throughout the respective resonators. However, the specifications of Kaida '652, Kaida '698, Ogawa and Kittaka are completely silent with respect to the thickness of any of the piezoelectric layers. Further, none of the cited references recognize the importance of maintaining a specific relationship between the thicknesses of the piezoelectric layers outside the outermost internal electrodes and the thickness of any piezoelectric layer between adjacent internal electrodes. The Examiner appears to be relying **solely** upon the drawings of

Kaida '652, Kaida '698, Ogawa and Kittaka to teach the relationships between the thicknesses of the piezoelectric layers outside the outermost internal electrodes and the thickness of any piezoelectric layer between adjacent internal electrodes. However, there is absolutely support in the disclosures of any of these references for the Examiner's allegations.

Accordingly, Applicant respectfully submits that Kaida ('652), Kaida ('698), Ogawa and Kittaka, taken individually or in combination, fail to teach or suggest the unique combination and arrangement of elements recited in claims 1, 3, 5 and 7 of the present application.

In view of the foregoing amendments and remarks, Applicant respectfully submits that claims 1, 3, 5 and 7are allowable. Claims 2, 4, 6 and 8-16 depend upon claims 1, 3, 5 and 7, and are therefore allowable for at least the reasons that claims 1, 3, 5 and 7 are allowable.

To the extent necessary, Applicant petitions the Commissioner for a Two-month extension of time, extending to March 15, 2002, the period for response to the Office Action dated October 15, 2001.

In view of the foregoing Remarks, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are respectfully solicited.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

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